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(54) **System and apparatus for recording data on an information storage medium**

System und Vorrichtung zur Aufzeichnung von Daten auf einem Informationsspeichermedium

Système et appareil pour l'enregistrement de données sur un support de stockage d'informations

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Description

Technical Field

[0001] The present invention relates to an information storage medium and a method and a system recording data on the same, and more particularly, to an information storage medium, which includes a plurality of recording layers having a layout structure of a lead-in area, a lead-out area, and a user data area to improve a recording speed and recording performance, and a method and a system recording data on the same.

Background Art

[0002] In general, an information storage medium is used in relation to a non-contact type optical pickup device for recording/reproducing data. A type of optical disk as an example of the information storage medium is divided into a compact disk (CD) or a digital versatile disk (DVD) based on the information recording capacity. In addition, examples of an erasable optical disk include 650 MB CD-R, CD-RW, and 4.7 GB DVD+RW. Furthermore, an HD-DVD having a recording capacity of 20 GB is being developed.

[0003] In order to increase the recording capacity, a shorter wavelength is used as a recording light source, and the numerical aperture of an object lens is increased. In addition, a plurality of information recording layers are used. US Patent No. 5,881,032 issued on March 9, 1999 discloses a DVD-ROM having a plurality of information recording layers.

[0004] A sector address structure of a disk having dual information recording layers is shown in FIG. 1A. The disk in FIG. 1A has a first information recording layer L1 and a second information recording layer L2 that have lead-in areas la and 2a and lead-out areas 16 and 2b, respectively. On the first information recording layer L1, a first sector address X is increased in a direction from an inner perimeter Rin of the disk to an outer perimeter Rout of the disk. On the second information recording layer L2, a second sector address X' is increased in a direction from the outer perimeter Rout to the inner perimeter Rin of the disk.

[0005] On the other hand, a multi-layered optical disk having more than two information recording layers can be divided into an opposite track path (OTP) and a parallel track path (PTP) based on directions of recording/reproducing data on/from the disk. The OTP reproduces data from the first information recording layer L 1 in a direction from the inner perimeter Rin to the outer perimeter Rout and reproduces data from the second information recording layer L2 in a direction from the outer perimeter Rout to the inner perimeter Rin, as shown in FIG. 1B. In other words, the track spiral directions of the OTP optical disk are alternately formed on each of the information recording layers. In addition, FIG. 1C denotes an OTP multi-layered optical disk having first through fourth information recording layers L1, L2, L3, and L4. In the OTP multi-layered optical disk, first through fourth lead-in areas 1a, 2a, 3a, and 4a and first through fourth lead-out areas 1b, 2b, 3b, and 4b are alternately formed at the inner perimeter regions and the outer perimeter regions of the first through fourth information recording layers L1, L2, L3, and L4 of the disk, respectively. The data is reproduced from the first information recording layer L1 in the direction from the inner perimeter Rin to the outer perimeter Rout, from the second information recording layer L2 in the direction from the outer perimeter Rout to the inner perimeter Rin, from the third information recording layer L3 in the direction from the inner perimeter Rin to the outer perimeter Rout, and from the fourth information recording layer L4 in the direction from the outer perimeter Rout to the inner perimeter Rin

[0006] FIG. 2 denotes a PTP dual-layered optical disk having a first information recording layer L1 from which data is reproduced in a direction from an inner perimeter Rin to an outer perimeter Rout and a second information recording layer L2 from which data is reproduced in a direction from the inner perimeter Rin to the outer perimeter Rout. In other words, track spiral directions of the information recording layers are the same. A first lead-in area 1a is formed at the inner perimeter portion of the first information recording layer L1, a first lead-out area 1b is formed at the outer perimeter portion of the first information recording layer L1, a second lead-in area 2a is formed at the inner perimeter portion of the second information recording layer L2, and a second lead-out area 2b is formed at the outer perimeter portion of the second information recording layer L2.

[0007] In the case of a multi-layered recordable disk, the lead-in areas 1a, 2a, 3a, and 4a and the lead-out areas 1b, 2b, 3b, and 4b include information about the disk and various conditions about recording. Accordingly, user data can be properly recorded and reproduced when reproducing the user data from the lead-in areas 1a, 2a, 3a, and 4a and the lead-out areas 1b, 2b, 3b, and 4b.

[0008] When the amount of the data to be recorded on the multi-layered information storage medium is smaller than the capacity of the information recording layers, there is an empty area on at least one information recording layer.

[0009] A method of processing the empty area of the information recording layer should be determined for various information storage media. FIG. 3A illustrates a single-layered recordable information storage medium, and FIG. 3B illustrates a dual layered recordable information storage medium. The locations and the capacities of lead-in areas, lead-out areas, and user data areas are fixed.

[0010] On the other hand, the data may be recorded on the entire area of the data area of the first information recording layer L1 and on a portion of the data area of the second information recording layer L2, as shown in FIG. 4. When a beam passes through the first information recording layer L1 and the second information recording

layer L2, the beam may pass through a portion L1 R of the first information recording layer L1 on which the data is recorded and a portion L2N of the second information recording layer L2 on which the data is not recorded, or the beam may pass through portions L1R and L2R of the first and second information recording layers L1 and L2 on which the data is recorded. Thus, when the reproducing conditions of the areas through which the beam passes are different, a reproducing characteristic may be affected. The closest prior art is represented by document EP 0 715 301 A2 which describes a multilayer OTP medium where program areas are formed to terminate at equivalent (radial) positions, wherein the total amount of data to be recorded is divided approximately equal among the different layers. US 2003/137915 A1, WO 03/102937 A and JP 9 069264 A describe other examples of OTP multilayer recording media with lead-out areas.

[0011] US5,881,032 is an example of the regular methods of recording information on an information storage medium by a parallel track path or opposite track path methods as recited above. The independent claims have been placed into the two-part form over this document.

Disclosure of Invention

Technical Problem

[0012] As described above, when determining the layout of an information storage medium, the consistency and unity with the information storage medium of a particular type should be considered and the reproducing performance of a multi-layered in- formation storage medium should be considered. In addition, it is important to improve a recording speed according to the increase of a recording capacity.

[0013] For example, a conventional recordable DVD has a single information recording layer and a capacity of 4.7 GB. On the other hand, a conventional DVO-ROM has a capacity of 8.5 GB and dual information recording layers. However, in order to back up the data from a DVD-ROM having a capacity of 8.5 GB, a recordable DVD having the same capacity is required. In addition, a method of efficiently recording data is required to reduce a back-up time of the data.

Technical Solution

[0014] According to the present invention there is provided a system and apparatus as set forth in the appended claims. Other features of the invention will be apparent from the dependent claims, and the description which follows.

Advantageous Effects

[0015] An information storage medium according to aspects of the present invention provides a physical layout of a recordable information storage medium. The information storage medium according to aspects of the present invention includes a plurality of information recording layers having lead-in areas, data areas, and lead-out areas, and the data areas are allotted to record approximately the same amount of data on each of the information recording layers. In addition, a layout for remaining areas after the recording of the data is provided to minimize a data recording time.

Description of Drawings

[0016] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

[0017] FIG. 1A illustrates a sector address structure of a conventional DVD-ROM double-layered optical disk;

[0018] FIG. 1B illustrates the arrangement of lead-in areas and lead-out areas of a conventional DVD-ROM opposite track pack (OTP) dual-layered optical disk;

[0019] FIG. 1C illustrates the arrangement of lead-in areas and lead-out areas of a conventional OTP four-layered optical disk;

[0020] FIG. 2 illustrates the arrangement of lead-in areas and lead-out areas of a conventional DVD-ROM parallel track path (PTP) four-layered optical disk;

[0021] FIGS. 3A and 3B are layouts of a conventional single-layered information storage medium and a conventional dual-layered information storage medium, respectively;

[0022] FIG. 4 illustrates regions to which a beam is input in the case where data is recorded on portions of a conventional dual-layered information storage medium;

[0023] FIGS. 5A and 5B are layouts of a dual information storage medium according to an embodiment of the present invention;

[0024] FIGS. 6A and 6B are layouts of a four-layered information storage medium according to another embodiment of the present invention; and

[0025] FIG. 7 illustrates a system of recording and/or reproducing data on/from an information storage medium according to an embodiment of the present invention.

Mode for Invention

[0026] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0027] An information storage medium according to an embodiment of the present invention has a plurality of information recording layers. Referring to FIG. 5A, each of the information recording layers includes a data area on which user data is recorded, and a lead-in area and

a lead-out area that are arranged at an inner perimeter and an outer perimeter of the data area, respectively.

[0028] The information storage medium according to an embodiment of the present invention may be applied to a recordable information storage medium, and more efficiently, to a recordable information storage medium on which the amount of data to be recorded is determined before recording data.

[0029] When an information storage medium includes a plurality of information recording layers, the amount, of data to be recorded is divided into the number of the information recording layers in order to record the same amount of data on each of the information recording layers. In other words, the capacities and the locations of the data areas and the lead-out areas may vary according to the amount of the data to be recorded.

[0030] FIG. 5A illustrates an opposite track path (OTP) dual layer information storage medium, and FIG. 5B illustrates a parallel track path (PTP) dual layer information storage medium. Referring to FIG. 5A, the dual layer information storage medium includes a First information recording layer L1 and a second information recording layer L2, and the information recording layers L1 and L2 include lead-in areas 20-L1 and 20-L2, data areas 30-L1 and 30-L2, and lead-out areas 40-L1 and 40-L2, respectively. In addition, when the amount of data to be recorded is predetermined, the amount of data is divided into halves and each half is allotted to the data areas 30-L1 and 30-L2, respectively. The reference character C denotes the maximum of the user data to be recorded.

[0031] In addition, the lead-out areas 40-L1 and 40-L2 arc arranged at the outer perimeters of the data areas 30-L1 and 30-L2 of the information recording layers to record the data in a pattern having a lead-out property. Thus, a location of the lead-out areas 40-L1 and 40-L2 varies depending on the amount of data recorded.

[0032] In this case, the lead-in area and the lead-out area that arc located in the middle in a data recording direction may be referred to as a middle area or a connection area. In other words, the lead-out area 40-L1 of the first information recording layer L1 and the lead-out area 40-L2 of the second information recording layer L2 in FIG. 5A, and the lead-out area 40-L1 of the first information recording layer L1 and the lead-in area 20-L2 of the second information recording layer L2 may be referred to as the middle areas or the connection areas.

[0033] On the other hand, an information storage medium according to an embodiment of the present invention includes a dedicated area for use by a recording and/or reproducing apparatus (hereinafter referred to as a drive) in order for the drive to read recording information before recording user data. The dedicated area may include, for example, a test area for performing a test for detecting an optimum recording power of a recording medium and/or an area of recording information about recording histories of the drive.

[0034] However, the test in the drive is performed before recording the user data, thus it is impossible to recognize the amount of data to be recorded. Therefore, the drive cannot determine the location of performing the test. As a result, the location of a test area should be fixed.

[0035] Referring to FIGS. 5A and 5B, dedicated areas for use by a drive, for example, test areas 45-L1 and 45-L2 may be fixed at the outmost perimeter of the information recording layers L1 and L2. When an information storage medium is loaded in the drive, the drive performs tests using the test areas 45-L1 and 45-L2 and records data. Thereafter, the drive records the pattern having the lead-out property at the outer perimeter of data areas 30-L1 and 30-L2, which are set depending on the size of the data to be recorded. The lead-out property is a data pattern to prohibit a pickup from separating from an information storage medium.

[0036] In the case where an empty area exists in the test areas 40-L1 and 40-L2 when the recording of the pattern having the lead-out property is finished, the areas 43-L1 and 43-L2 between the lead-out areas 40-L1 and 40-L2 and the test areas 45-L1 and 45-L2, respectively, remain empty. Since the empty areas 43-L1 and 43-L2 are present, a recording time can be reduced compared to a case where the pattern having the lead-out property is recorded at the outmost perimeter of a recording medium. In addition, in order to efficiently move a pickup between recording layers, the recording may be performed according to an OTP type.

[0037] FIGS. 6A and 6B illustrate an OTP multi-layered information storage medium and a PTP multi-layered information storage medium including first through fourth information recording layers L1, L2, L3, and L4, respectively.

[0038] The first through fourth information recording layers L1, L2, L3, and L4 include lead-in areas 20-L1. 20-L2. 20-L3, and 20-L4, data areas 30-L1, 30-L2, 30-L3, and 30-L4, lead-out areas 40-L1, 40-L2, 40-L3, and 40-L4, and dedicated areas for a drive 45-L1, 45-L2, 45-L3, and 45-L4, respectively.

[0039] The amount of data to be recorded is divided to be approximately equally distributed among the data areas 30-L1, 30-L2, 30-L3, and 30-L4 each having the same capacity that are formed on the first through fourth information recording layers L1, L2, L3, and L4, respectively. In addition, the lead-out areas 40-L1,40-L2, 40-L3, and 40-L4 are arranged following the data areas 30-L1, 30-L2, 30-L3, and 30-L4 on which the user data is recorded. The reference character C designates a maximum amount of user data that may be recorded. The pattern having a lead-out property is recorded on the lead-out areas 40-L1, 40-L2, 40-L3, and 40-L4.

[0040] The dedicated areas 45-L1, 45-L2, 45-L3, and 45-L4 may be arranged at the outmost perimeter of the information recording layers L1, L2, L3, and L4. When areas remain between the lead-out areas 40-L1, 40-L2, 40-L3, and 40-L4 and the dedicated areas 45-L1, 45-L2, 45-L3, and 45-L4, these areas are empty 43-L1, 43-L2, 43-L3 and 43-L4.

[0041] FIG. 7 illustrates a system recording/reproduc-

ing data on/from an information storage medium according to an embodiment of the present invention.

[0042] A system recording/reproducing data includes a pickup unit 50, a recording/reproducing signal process unit 60, and a control unit 70. More specifically, the system includes a laser diode 51 of radiating a beam, a collimating lens 52 of collimating the beam radiated from the laser diode 51, a beam splitter 54 of converting the path of the incidence beam, and an objective lens 56 of concentrating the beam from the beam splitter 54 on an information storage medium D.

[0043] The beam reflected from the information storage medium D is reflected on the beam splitter 54 and received by an optical detector, for example, a quadrant optical detector 57. The beam received by the optical detector 57 is converted into electric signals by passing through an operation circuit unit 58 and output as RF signals, In other words, channel Ch1 detects a sum of signals and differential signal channel Ch2 detects push-pull signals.

[0044] Referring to FIG. 5A, by way of example, the control unit 70 performs a test in test areas 45-L1 and 45-L2 of the information storage medium D before recording data on the information storage medium D. In addition, the control unit 70 records approximately the same amount of user data on each of the information recording layers L 1 and L2 of the information storage medium D. The control unit 70 controls the pickup unit 50 to radiate a recording beam of a proper power, which is obtained by the test, to record the user data on the information storage medium D. When the recording of the user data is finished, the pattern of a lead-out property is recorded in at least one of the lead-out areas 40-L1 or 40-L2.

[0045] In addition, when areas 43-L1 and 43-L2 remain between the data areas and the test areas 45-L1 and 45-L2, the control unit 70 finishes the recording without recording data on the areas 43-L 1 and 43-L2 (i.e., the areas arc left empty).

[0046] In order to reproduce the data from the information storage medium D, a beam reflected from the information storage medium D is input to the optical detector 57 by passing through the objective lens 56 and the beam splitter 54. The signals input to the optical detector 57 are converted into electric signals by the operation circuit unit 58 and output as RF signals.

[0047] A method of recording data according to aspects of the present invention recognizes the amount of data to be recorded on an information storage medium when the information storage medium is loaded on a drive, and performs a test on a dedicated area for the drive, for example, a test area of the information storage medium. Thereafter, the amount of the data is divided to allot data areas having approximately the same amount on each of information recording layers. Then, the data is recorded based on the allotted amount of data, and the data having a lead-out property is recorded following the data areas on the information recording layers.

[0048] On the other hand, when areas remain between the lead-out areas and the dedicated areas for the drive, these areas are empty.

Claims

1. A system recording data on a recordable information storage medium having a plurality of information recording layers (L1, L2), wherein each of the information recording layers (L1, L2) includes a lead-in area (20), a user data area (30) and a lead-out area (40), the system comprising:

a pickup unit (50) radiating a beam to the information storage medium; and
a recording/reproducing signal process unit (60) receiving the beam reflected on the information storage medium through the pickup unit and performing a signal process;
characterised by:

a control unit (20) performing a test in a dedicated area (45) of each information recording layer (L1, L2) for the system and
dividing an amount of user data that is less than the maximum of user data recordable on the recordable information storage medium to be recorded into the number of the information recording layers (L1, L2) to record an approximately equal amount of data in the respective data area on each of the information recording layers (L1, L2) and to record a lead-out property pattern at the outer perimeter of the respective data areas (30-L1, 30-L2), which are set depending on the size of the data to be recorded, the lead-out pattern delineating each respective data area.

2. An apparatus, comprising:

an optical pickup (50) recording and/or reproducing data on/from a plurality of recording layers (L1, L2) of an information storage medium; and
characterised by:

a controller (70) determining operation information of the information storage medium by controlling the optical pickup to perform tests in a dedicated area (45) of each of the plurality of recording layers (L1, L2) of the information storage medium, determining a size of data to be recorded on the information storage medium that is less than the maximum of user data recordable on the recordable information storage me-

dium, dividing the size of the data approximately equally among the recording layers, controlling the optical pickup (50) to record the divided data in a data area (30) of each of the recording layers (L1, L2) and recording a lead-out property pattern at the outer perimeter of the respective data areas (30-L1, 30-L2), which are set depending on the size of the data to be recorded, the lead-out pattern delineating each respective data area (30).

3. The apparatus of claim 2, wherein the lead-out property pattern is recorded in a lead-out area (40), a position of which varies depending on the divided size of the data.

4. The apparatus of claim 2 or 3, wherein the dedicated area (45) is at an outmost perimeter of the information storage medium.

5. The apparatus of claim 4, wherein an area (43) between the delineated data area and the dedicated area (45) is free from data.

Patentansprüche

1. System, das Daten auf einem bespielbaren Informationsspeichermedium aufzeichnet, das mehrere Informationsaufzeichnungsschichten (L1, L2) aufweist, wobei jede der Informationsaufzeichnungsschichten (L1, L2) einen Einlaufbereich (20), einen Benutzerdatenbereich (30) und einen Auslaufbereich (40) umfasst, wobei das System Folgendes umfasst:

eine Pickup-Einheit (50), die einen Strahl auf das Informationsspeichermedium strahlt; und
eine Aufzeichnungs-/Wiedergabesignalprozesseinheit (60), die den auf dem Informationsspeichermedium reflektierten Strahl durch die Pikkup-Einheit empfängt und einen Signalprozess ausführt;
gekennzeichnet durch
eine Steuereinheit (70), die einen Test in einem dedizierten Bereich (45) jeder Informationsaufzeichnungsschicht (L1, L2) für das System ausführt, und
Aufteilen einer Menge von Benutzerdaten, die kleiner als das Maximum der Benutzerdaten, die auf dem bespielbaren Informationsspeichermedium aufgezeichnet werden können, ist, zur Aufzeichnung in die Anzahl der Informationsaufzeichnungsschichten (L1, L2), um eine ungefähr gleiche Menge von Daten in dem jeweiligen Datenbereich auf jeder der Informationsaufzeichnungsschichten (L1, L2) aufzuzeichnen und um ein Auslaufeigenschaftsmuster an dem äußeren Perimeter der jeweiligen Datenbereiche (30-L1, 30-L2) aufzuzeichnen, die abhängig von der Größe der aufzuzeichnenden Daten eingerichtet werden, wobei das Auslaufmuster jeden jeweiligen Datenbereich abgrenzt.

2. Vorrichtung, umfassend:

einen optischen Pickup (50), der Daten auf/aus mehreren Aufzeichnungsschichten (L1, L2) eines Informationsspeichermediums aufzeichnet und/oder wiedergibt; und
gekennzeichnet durch
eine Steuerung (70), die Betriebsinformationen des Informationsspeichermediums **durch** Steuern des optischen Pickup bestimmt, um Tests in einem dedizierten Bereich (45) jeder der mehreren Aufzeichnungsschichten (L1, L2) des Informationsspeichermediums auszuführen, eine Größe von auf dem Informationsspeichermedium aufzuzeichnenden Daten bestimmt, die kleiner als das Maximum von Benutzerdaten ist, die auf dem bespielbaren Informationsspeichermedium aufgezeichnet werden können, die Größe der Daten ungefähr gleich unter den Aufzeichnungsschichten aufteilt, den optischen Pikkup (50) steuert, um die aufgeteilten Daten in einem Datenbereich (30) jeder der Aufzeichnungsschichten (L1, L2) aufzuzeichnen, und ein Auslaufeigenschaftsmuster an dem äußeren Perimeter der jeweiligen Datenbereiche (30-L1, 30-L2) aufzeichnet, die abhängig von der Größe der aufzuzeichnenden Daten eingerichtet werden, wobei das Auslaufmuster jeden jeweiligen Datenbereich (30) abgrenzt.

3. Vorrichtung nach Anspruch 2, wobei das Auslaufeigenschaftsmuster in einem Auslaufbereich (40) aufgezeichnet wird, wovon eine Position abhängig von der aufgeteilten Größe der Daten variiert.

4. Vorrichtung nach Anspruch 2 oder 3, wobei sich der dedizierte Bereich (45) an einem äußersten Perimeter des Informationsspeichermediums befindet.

5. Vorrichtung nach Anspruch 4, wobei ein Bereich (43) zwischen dem abgegrenzten Datenbereich und dem dedizierten Bereich (45) frei von Daten ist.

Revendications

1. Système conçu pour enregistrer des données sur un support de stockage d'informations enregistrable possédant une pluralité de couches d'enregistrement d'informations (L1, L2), chacune des couches d'enregistrement d'informations (L1, L2) comportant

une zone de début de session (20), une zone de données d'utilisateur (30) et une zone de fin de session (40), le système comprenant :

un module tête de lecture (50) conçu pour rayonner un faisceau en direction du support de stockage d'informations ; et
un module de traitement de signal d'enregistrement/reproduction (60) conçu pour recevoir le faisceau réfléchi par le support de stockage d'informations à travers le module tête de lecture et exécuter un traitement de signal ;
caractérisé par :

un module de commande (70) conçu pour exécuter un test dans une zone réservée (45) de chaque couche d'enregistrement d'informations (L1, L2) pour le système et répartir une quantité de données d'utilisateur, qui est inférieure à la quantité maximale de données d'utilisateur enregistrable sur le support de stockage d'informations enregistrable à enregistrer, dans la pluralité de couches d'enregistrement d'informations (L1, L2) de manière à enregistrer une quantité sensiblement égale de données dans les zones de données respectives sur chacune des couches d'enregistrement d'informations (L1, L2) et à enregistrer un motif de propriété de fin de session au niveau du périmètre extérieur des zones de données respectives (30-L1, 30-L2), établies en fonction de la taille des données à enregistrer, le motif de fin de session délimitant chaque zone de données respective.

2. Appareil, comprenant :

une tête de lecture optique (50) conçue pour enregistrer et/ou reproduire des données sur/à partir d'une pluralité de couches d'enregistrement (L1, L2) d'un support de stockage d'informations ;
caractérisé par :

un dispositif de commande (70) conçu pour établir des informations de fonctionnement du support de stockage d'informations en commandant la tête de lecture optique pour lui faire exécuter des tests dans une zone réservée (45) de chacune de la pluralité de couches d'enregistrement (L1, L2) du support de stockage d'informations, établir une taille de données à enregistrer sur le support de stockage d'informations qui est inférieure à la quantité maximale de données d'utilisateur enregistrable sur le support de stockage d'informations enregistrable, répartir la taille des données sensiblement équitablement parmi les couches d'enregistrement, commander la tête de lecture optique (50) pour lui faire enregistrer les données réparties dans une zone de données (30) de chacune des couches d'enregistrement (L1, L2), et enregistrer un motif de propriété de fin de session au niveau du périmètre extérieur des zones de données respectives (30-L1, 30-L2), établies en fonction de la taille des données à enregistrer, le motif de fin de session délimitant chaque zone de données respective (30).

3. Appareil selon la revendication 2, le motif de propriété de fin de session étant enregistré dans une zone de fin de session (40), dont une position varie en fonction de la taille répartie des données.

4. Appareil selon la revendication 2 ou 3, la zone réservée (45) se situant au niveau d'un périmètre le plus à l'extérieur du support de stockage d'informations.

5. Appareil selon la revendication 4, une zone (43) entre la zone de données délimitée et la zone réservée (45) étant dépourvue de données.

FIG. 1A (PRIOR ART)

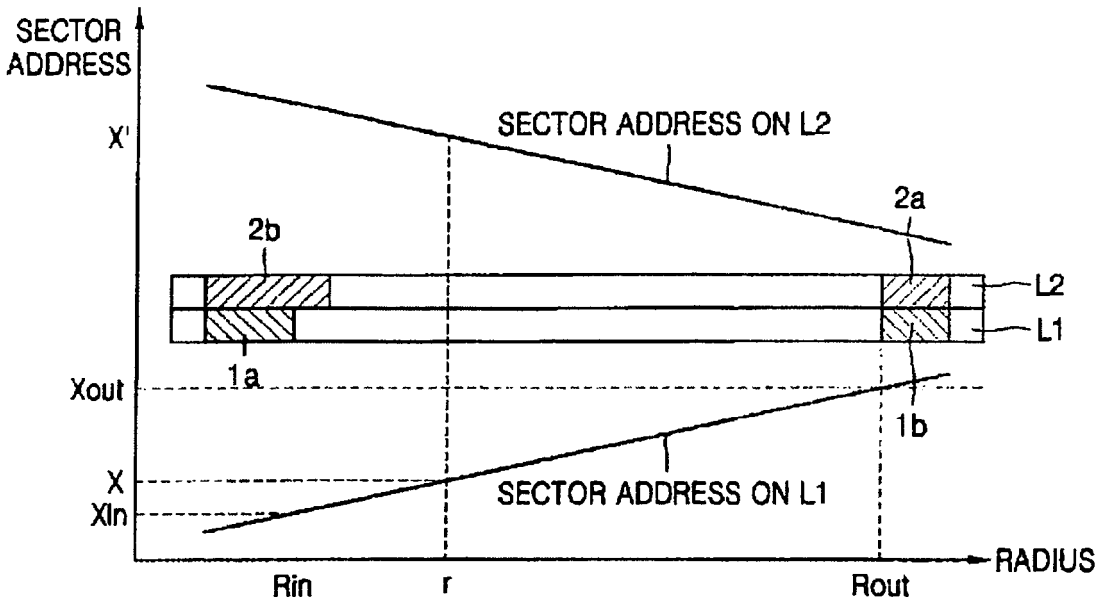


FIG. 1B (PRIOR ART)

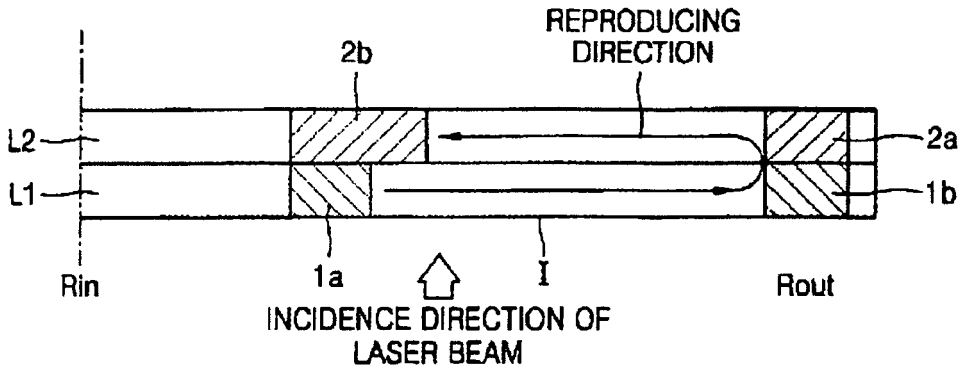


FIG. 1C (PRIOR ART)

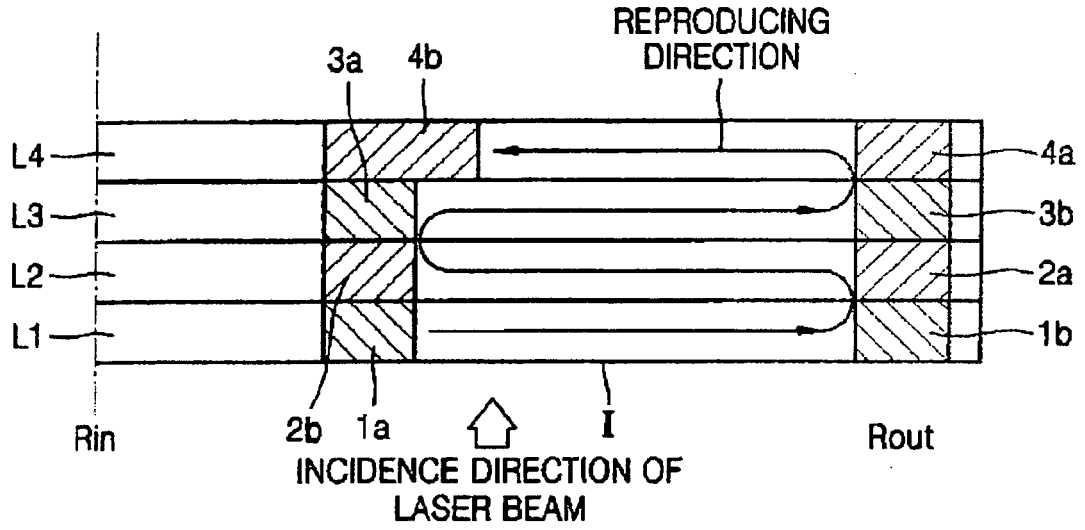


FIG. 2 (PRIOR ART)

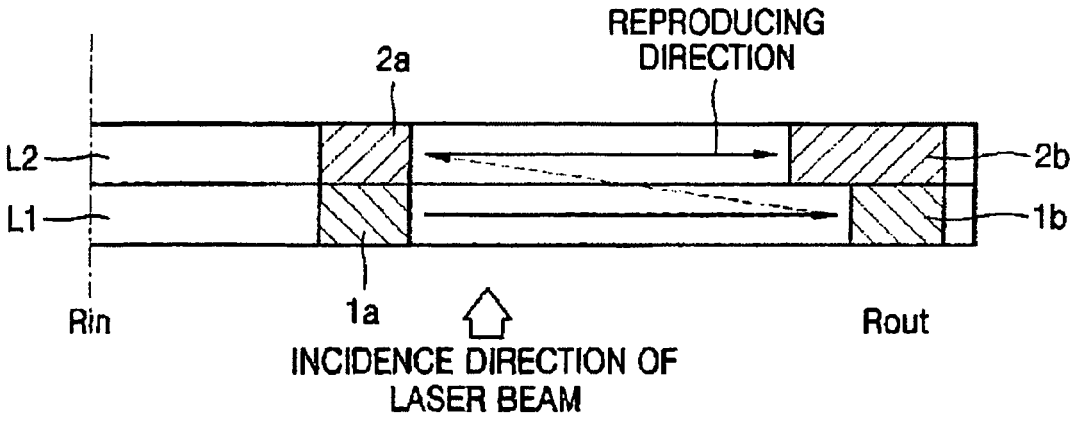


FIG. 3A (PRIOR ART)

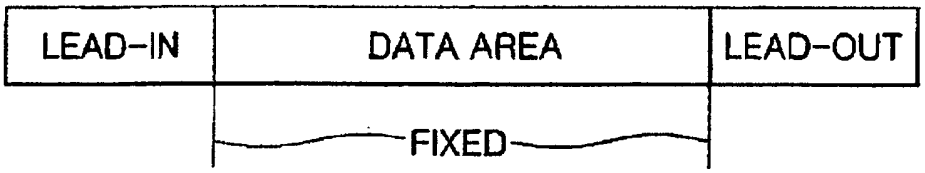


FIG. 3B (PRIOR ART)

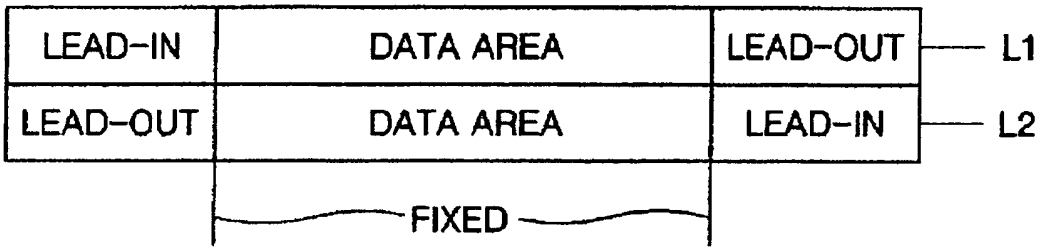


FIG. 4 (PRIOR ART)

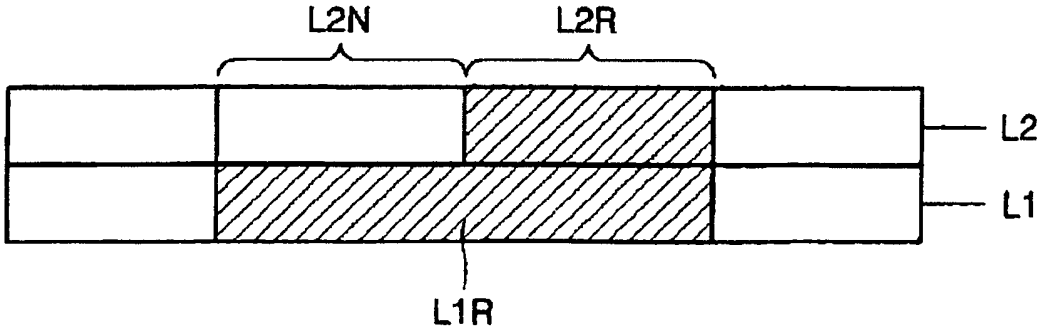


FIG. 5A

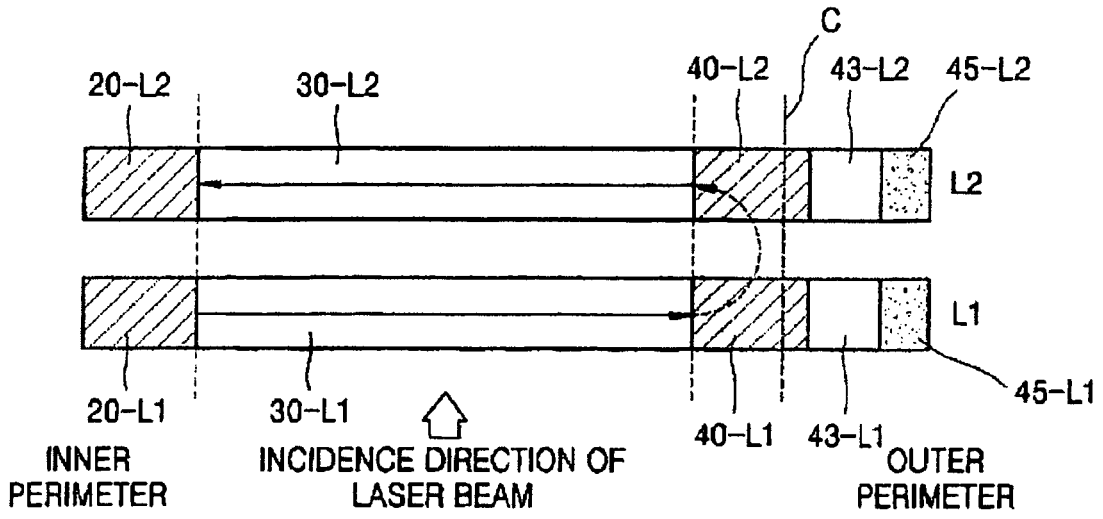

C
20-L2
30-L2
40-L2
43-L2
45-L2
L2
L1
45-L1
20-L1
30-L1
40-L1
43-L1
INNER PERIMETER
INCIDENCE DIRECTION OF LASER BEAM
OUTER PERIMETER

FIG. 5B

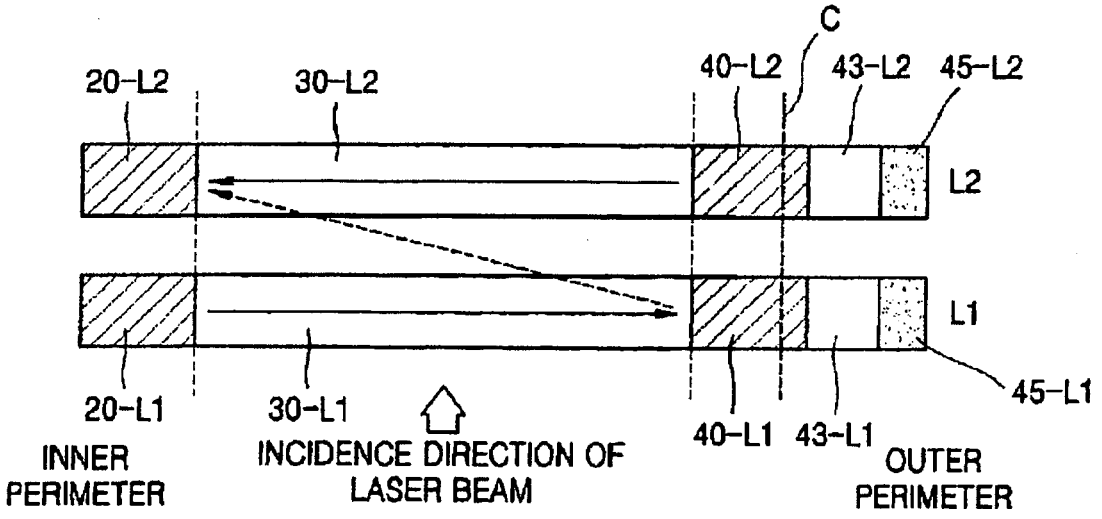

C
20-L2
30-L2
40-L2
43-L2
45-L2
L2
L1
45-L1
20-L1
30-L1
40-L1
43-L1
INNER PERIMETER
INCIDENCE DIRECTION OF LASER BEAM
OUTER PERIMETER

FIG. 6A

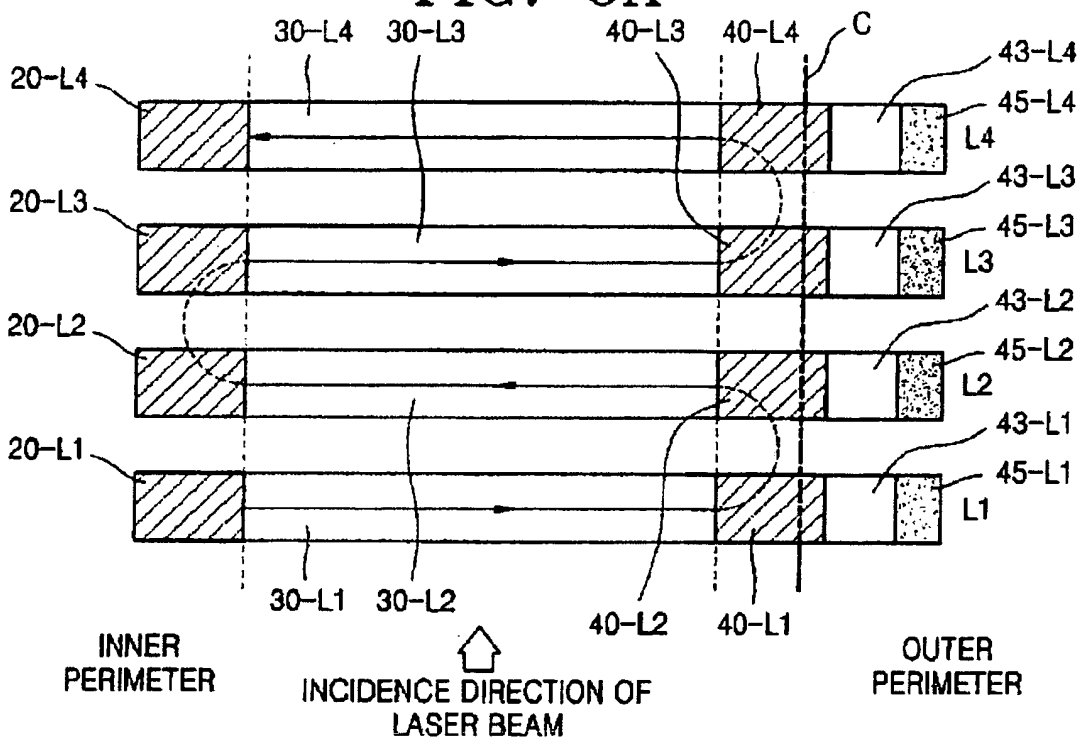

30-L4
30-L3
40-L3
40-L4
C
43-L4
45-L4
L4
20-L4
20-L3
43-L3
45-L3
L3
20-L2
43-L2
45-L2
L2
20-L1
43-L1
45-L1
L1
30-L1
30-L2
40-L2
40-L1
INNER PERIMETER
INCIDENCE DIRECTION OF LASER BEAM
OUTER PERIMETER

FIG. 6B

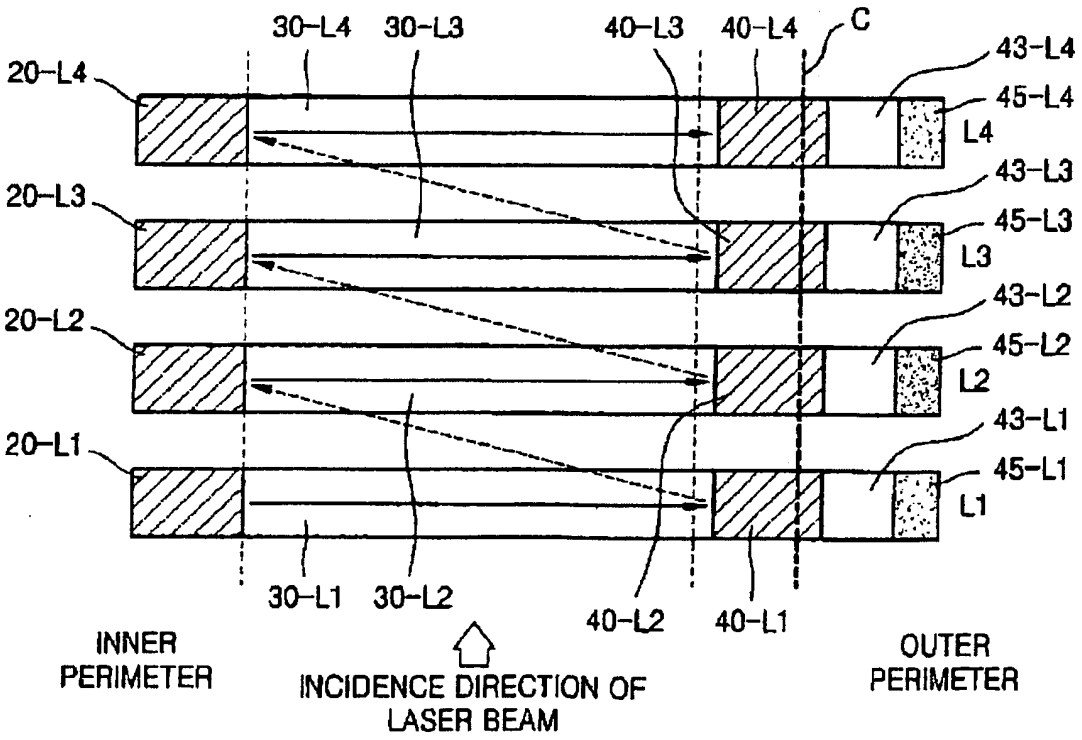
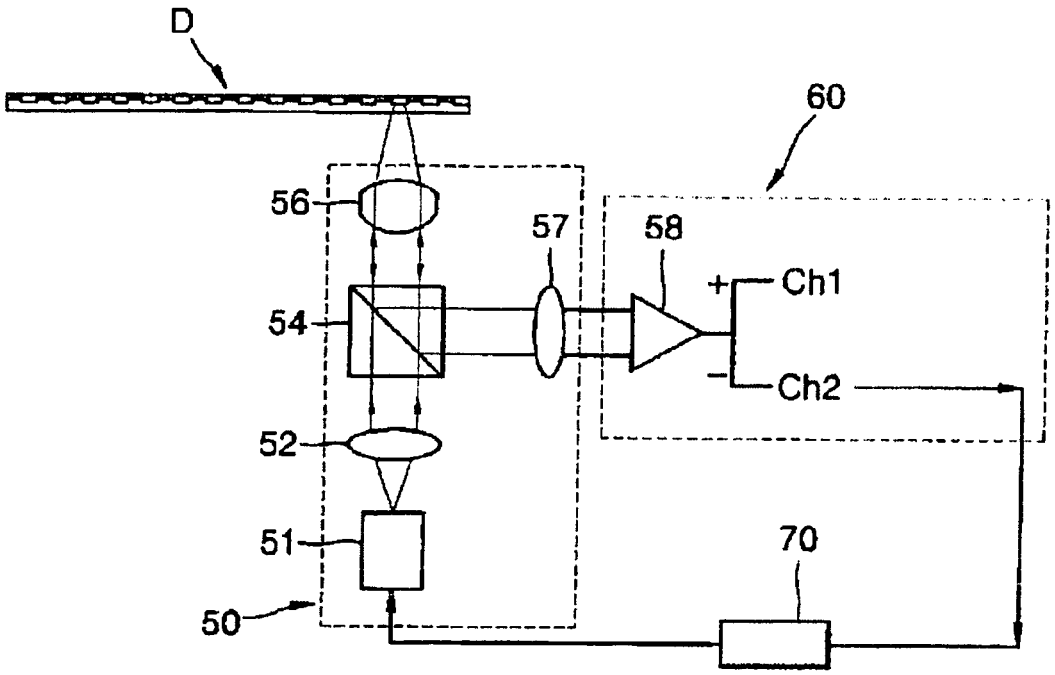

30-L4
30-L3
40-L3
40-L4
C
43-L4
45-L4
L4
20-L4
20-L3
43-L3
45-L3
L3
20-L2
43-L2
45-L2
L2
20-L1
43-L1
45-L1
L1
30-L1
30-L2
40-L2
40-L1
INNER PERIMETER
INCIDENCE DIRECTION OF LASER BEAM
OUTER PERIMETER

FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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